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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/722,225

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Helmut Barfuss

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SCHIFF HARDIN, LLP  
PATENT DEPARTMENT  
6600 SEARS TOWER  
CHICAGO, IL 60606-6473

EXAMINER

MOTSINGER, SEAN T

ART UNIT

PAPER NUMBER

2624

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No. 10/722,225	Applicant(s) BARFUSS ET AL.	
	Examiner Sean Motsinger	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 9/26/2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 10-16, 22 and 23 is/are rejected.
- 7) ☐ Claim(s) 5-9, 17-21 and 24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date: _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/30/2004</u> .   | 6) <input type="checkbox"/> Other: _____                          |

***Objections to the drawings***

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, all of the steps of claims 1-9 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.
2. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Objections to the Claims***

3. Claims 5, 15 and 23 are objected to because of the following informalities: in claim 15 and 23 "said position sensor" lacks antecedent basis examiner is interpreting claim 15 to depend from claim 14 and claim 23 to depend from claim 22 to correct the problem; in claims 5 "said Cartesian coordinates" should read "Cartesian coordinates". Appropriate correction is required.

***Rejections Under 35 USC 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 2-4, 11-16 and 22-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Re claims 2-4 and 11-13, claim 2 and 11 the term "two-dimensional image dataset" lacks proper antecedent basis and description in the claim to be used as claimed. The remaining claims are rejected for depending from the unclear claims and failing to resolve the issue. For the purposes of examination examiner is excluding the language "and in the two-dimensional image data set" as it is believed this was included in error.

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6. Re claims 14, 15, 22 and 23 it is apparent from claims 15 and 23 respectively and the "position sensor" is the mark itself. It is unclear how the position sensor is identifying itself. For the purposes of examination examiner is interpreting claims 12 and 22 to read "wherein said navigation system includes position sensors providing marks for the registration. The remaining claims are rejected for depending from the unclear claims and failing to resolve the issue.
7. Re claims 16 the feature "data processing system" lacks proper antecedent basis and description in the claim to be used as claimed. For the purposes of examination examiner is excluding the language following "and wherein" as it is believed this was included in error.

***Rejections Under 35 USC 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 10, 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al US 6,052,477 in view of "Volume Registration by Surface Point Signature and Mutual Information Maximization with Applications in Intra-Operative

MRI Surgeries," Eldeib et al, Proc. Int. Conf. On Image Processing, Vol. 1 (2000)  
200-203 hereinafter "Eldeib"

9. Re claim 1 Wang discloses A method for determining coordinates of images of marks in a volume dataset, said marks being disposed on a surface of a subject and said volume dataset containing the images of the marks and an image of at least a part of the subject containing the surface on which the marks are disposed (see abstract Note Wang discloses a method capable of performing this function), comprising the steps of: determining coordinates (centroids) of the images of the marks in the volume dataset (column 2 lines 24-27).
10. Wang does not disclose segmenting the image of the surface; transforming the volume dataset so that the segmented image of the surface is transformed into a plane; generating an image dataset substantially comprising pixels of the image of the surface after transformation into the plane and pixels of the images of the marks; determining coordinates of the images of the marks in the image dataset.
11. Eldeib discloses segmenting the image of the surface (see section 2 paragraph 1 line1 note the surface is being segmented out); transforming the volume dataset so that the segmented image of the surface is transformed into a plane (see section 2 paragraph 1 lines 8-11); generating an image dataset substantially comprising pixels of the image of the surface (see section 2 paragraph 1 line1 note the surface is being segmented out) after transformation into the plane and pixels of the images of the marks (note the marks of Wang will also be found because the are disposed on

the surface section 2 paragraph 1 line1); determining coordinates of the images of the marks in the image dataset (section 2 paragraph 5 note Eldeib discloses that this can be useful for matching operations (ie finding marks) and section 3 paragraph one volume registration). The advantage of Eldeib is one can "...now use matching image processing tools in the matching hence reduceing the time taken..." (section 2 paragraph 5). Therefore it would have been obvious to combine Eldeib with Wang to reach the aforementioned advantage.

12. Re claim 2 Eldeib further discloses determining the coordinates of the images of the marks in the image dataset by filtering (template matching section 2 paragraph 5 line 8) said image dataset.
13. Re claim 10 Wang discloses A medical apparatus comprising: a medical imaging device (CT or MRI scanner see column 1 lines 33-36) for obtaining a volume dataset (column 1 line 33) from a subject representing an image of at least a portion of the subject (patient column1 line 34) containing a surface on which a plurality of marks are disposed (feiducial markers column 1 line 25), and images of the marks (note the language following "for" is intended use and the CT scanner need only be capable of said function); a navigation system (navigation column 1 line 46) for relating coordinates of the volume dataset (images column 1line 47) to coordinates of the subject (patient anatomy column 1 line 47) by a coordinate transformation (mapping between the coordinates column 1 lines 49-50) during a registration

(column 1 line 48); and determining coordinates of the images of the marks in the volume dataset.

14. Wang does not disclose said navigation system segmenting the image of the surface, transforming the volume dataset so that the segmented image of the surface is transformed into a plane, generating an image dataset substantially comprising pixels of the image of the surface after transformation into the plane and pixels of the images of the marks, determining coordinates of the images of the marks in the image dataset.
15. Eldeib discloses segmenting the image of the surface (see section 2 paragraph 1 line1 note the surface is being segmented out); transforming the volume dataset so that the segmented image of the surface is transformed into a plane (see section 2 paragraph 1 lines 8-11); generating an image dataset substantially comprising pixels of the image of the surface (see section 2 paragraph 1 line1 note the surface is being segmented out) after transformation into the plane and pixels of the images of the marks (note the marks of Wang will also be found because they are disposed on the surface section 2 paragraph 1 line1); determining coordinates of the images of the marks in the image dataset (section 2 paragraph 5 note Eldeib discloses that this can be useful for matching operations (ie finding marks) and section 3 paragraph one volume registration). The advantage of Eldeib is one can "...now use matching image processing tools in the matching hence reducing the time taken..." (section 2 paragraph 5). Therefore it would have been obvious to combine Eldeib with Wang to reach the aforementioned advantage.



16. Re claim 11 Eldeib further discloses filter for filtering the image dataset to determine the coordinates of the marks in the image dataset (template matching section 2 paragraph 5 line 8).
17. Re claim 14 Wang discloses wherein said navigation system includes a position sensor (fiducial mark see abstract) providing the marks for the registration.
18. Re claim 15 Wang discloses wherein said position sensor is an automatically optically detectable mark (fiducial mark see abstract).
19. Re claim 16 wherein said medical imaging device is a first medical imaging device, and further comprising a second medical imaging device (MRI column 1 line 42) for obtaining an image of the subject.
20. Claims 3-4 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Eldeib in further view of "Digital Picture Processing," Rosenfeld et al (1982), pages 37-49
21. .
22. Re claim 3 Wang and Eldieb disclose all of the elements of claim 2. Eldeib does not disclose any suitable method of template matching i.e. does not disclose filtering

said image dataset with a filter matched to said marks. Rosenfeld discloses filtering (linear matched filtering section 9.4.2 title) said image dataset with a filter matched to said marks (matched filtering section 9.4.2 paragraph 1 lines 4-6). The motivation for combining is that "under certain assumptions the best filter to use is  $f$  itself (i.e. matched filter)." Therefore it would be obvious to one of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the aforementioned advantage.

23. Re claim 4, Wang and Eldieb disclose all of the elements of claim 2. Eldeib does not disclose any suitable method of template matching i.e. does not disclose filtering said image dataset according to the minimum square error sum. Rosenfeld discloses filtering said image dataset according to the minimum square error sum (Section 9.4.1 paragraph 1 note the third of these expressions is the minimum square error.) The motivation for combining is that "if we use  $\iint (f-g)^2$  as a measure of mis-match we can derive an important measure of match" Therefore it would be obvious to one of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the aforementioned advantage.

24. Re claim 12 Wang and Eldieb disclose all of the elements of claim 2. Eldeib does not disclose any suitable method of template matching i.e. does not disclose wherein said filter is matched to said marks. Rosenfeld discloses wherein said filter is matched to said marks (matched filtering section 9.4.2 paragraph 1 lines 4-6). The motivation for combining is that "under certain assumptions the best filter to use is  $f$

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itself (i.e. matched filter)." Therefore it would be obvious to one of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the aforementioned advantage.

25. Re claim 13, Wang and Eldieb disclose all of the elements of claim 2. Eldeib does not disclose any suitable method of template matching i.e. does not whereing said filter filters according to the minimum square error sum. Rosenfeld discloses filtering said image dataset according to the minimum square error sum (Section 9.4.1 paragraph 1 note the third of these expressions is the minimum square error.) The motivation for combining is that "if we use  $\iint (f-g)^2$  as a measure of mis-match we can derive an important measure of match" Therefore it would be obvious to one of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the aforementioned advantage.

***Allowable Subject Matter***

26. Claims 17-21 and 24 are allowed. Claim 5-9, 23, and 24 will be allowable once the objections and 112 rejections to these claims are corrected. Claim 5 and 17 contain allowable subject matter because the a step of or a navigation system generating a two-dimensional image dataset by extracting image data representing the images of the marks in a region parallel to the imaged surface is not found in the prior art of record. Claims 8-9 and 18-24 are objected too because they depend from

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an objected base claim however contain allowable subject matter because they depend from these claims.

***Conclusion***

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean Motsinger whose telephone number is 571-270-1237. The examiner can normally be reached on 9-5 M-F.
28. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571)272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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29. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Motsinger  
3/27/2007

JINGGE WU  
SUPERVISORY PATENT EXAMINER

